

**Melaleuca Eradication and Other Exotic Plants
Implement Biological Control Project
RECOVER Evaluation of Project-Level Performance Measures
(Final 01/30/07)**

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1.0 Introduction

The role of the Restoration Coordination and Verification (RECOVER) team is to organize and apply scientific and technical information in ways that are most effective in supporting the objectives of the Comprehensive Everglades Restoration Plan (CERP). RECOVER links science and its tools to a set of system-wide planning, evaluation and assessment tasks. These links provide RECOVER with the scientific basis for meeting its overall objectives of evaluating and assessing Comprehensive Plan performance and refining and improving the plan during the implementation period. RECOVER fulfills this role by working with project delivery teams (PDTs) to help them meet CERP's system-wide goals and objectives. Specifically, RECOVER reviews performance measures for project-level evaluation of alternatives for consistency with the system-wide evaluation performance measures developed by RECOVER.

The purpose of this performance measure consistency review is to 1) ensure project's goals and objectives are consistent with the goals and objectives of CERP; 2) identify general compatibility of project-level performance measures with applicable system-wide performance measures and 3) suggest improvements to the project performance measures with the intent of improving target or evaluations methods to better evaluate project alternative plans that, if pursued, would contribute to selecting a tentative plan with the best performance by the project in achieving ecosystem restoration goals. The review comments below are suggestions for enhancing the existing set of performance measures. Comments on the specific project-level performance measure are presented in Attachment A.

2.0 General Document Comments

The Melaleuca Biocontrol Project performance measures are generally well developed and consistent with CERP performance measures and goals; however, they lack numerical targets needed to quantify 1) the level of success achieved, 2) the area affected, and 3) the time frames associated with different levels of success. These targets need to be defined and included in the documentation sheets for each performance measure. RECOVER also suggests the project team provide some additional information to the Performance Measure fact sheets to aid document

reviewers and developers. Finally, RECOVER suggests refining or removing BC-1 as a performance measure.

Utility of Performance Measures in Evaluating Project Alternatives -

This project is unique in that alternatives to eradicate exotic plant species are not being evaluated and thus the project is more a "pilot" study to test effectiveness of biocontrol agents to control/reduce exotic plant species. Focusing on the improvement in habitat quality within specific areas of infestation may make it easier to both predict and monitor success. By defining numerical targets within the table, and the time increment within which changes are anticipated to occur, the project team could more accurately assess project success.

RECOVER considers BC-1 more of a method of eradication than a performance measure. In addition, it is unclear how the project team would differentiate between effectiveness of each released agent. However, potential performance measures that link and measure the biocontrol agent to host plant vigor such as growth rate, seed or flower production, or rate of host plant population expansion, may provide a mechanism for evaluation.

3.0 Consistency with RECOVER System-Wide Evaluation Performance Measures

RECOVER has a draft performance measure based on an earlier version BC-1. The RECOVER performance measure has not been finalized or accepted, but could benefit from the additional work done by this team.

Water Quality – The performance measures do not address water quality.

Hydrologic Targets – The performance measures are not tied to the hydrology that CERP would change. However, changes in hydrology are likely to affect the fitness of either host plants and/or on the survival and dispersal of biocontrol agents. For instance, *Oxyops vitiosa* pupates in the ground, so hydrology would affect emergence, and therefore the rate of spread for this agent. Assuming sufficient information does not yet exist to create robust hypotheses on these interrelationships, they probably deserve discussion under the heading of “uncertainties” in the performance measures documentation.

Ecological Targets – The opportunity exists for this project to greatly improve habitat quality in areas infested with *Melaleuca* beyond the improvements made by hydrologic changes. The methodology described using the four data coverages should allow the project team to assess progress within release areas of biocontrol agents. Overlaying the invasive exotic species information from the four data collection efforts should provide information about how invasive species and native

communities relate in terms of species presence, abundance and cover and may provide insights into differences in native community vulnerabilities or habitat preferences of exotics and/or biocontrol agents.

Consistency among Projects and RECOVER – The goals, objectives and performance measures of the Biocontrol Project are consistent with the RECOVER regional performance measures and CERP system-wide goals and objectives. Although the Biocontrol Project is over a large geospatial area, there are not any identifiable projects that the Melaleuca Biocontrol Project is anticipated to directly interact with or affect. There are other CERP projects with exotic vegetation eradication efforts, such as Lakes Park. Although these projects are not duplicating efforts, there may be an opportunity to use information or performance measures developed for the project level. The efforts of these projects are consistent with the goals and objectives of CERP and the performance measures of RECOVER.

4.0 Conclusions

RECOVER finds that the project-level performance measures developed by the project team are compatible with the CERP system-wide evaluation performance measures developed by RECOVER and consistent with the CERP goals and objectives. RECOVER and the Science Coordination Group are working on a set of Melaleuca and exotic species performance measures which may be available in the future but could benefit from the information gathered by this project. Other CERP projects are considering exotic species performance measures and could also benefit by the proposed project-level performance measures.

ATTACHMENT A – MELALEUCA BICONTROL PM CONSISTENCY REVIEW
RECOVER COMMENTS

<p>BC-1 Increase Dissemination of Biological Control Agents</p>
<p><i>CERP Goal:</i> Increase the total spatial extent of natural areas; improve habitat and functional quality; improve native plant and animal species abundance and diversity</p>
<p><i>CERP Hypotheses:</i> (1) Accelerating the introduction and dispersal of biological control agents will reduce the vigor of invasive plant species. (2) Reductions in invasive plant vigor will promote restoration of desirable native plant species.</p>
<p><i>Project Objective/Constraints:</i> Prevent invasive species from invading unimpacted or restored natural areas</p>
<p>Target: 90% of monitored plants have been colonized by the biological control agent being released.</p>
<p>Evaluation Method: Model outputs will describe the sizes, frequencies, and geospatial distribution of releases needed to achieve saturation of CERP lands by each biological control agent within several different temporal scales. They will also incorporate an Exotic Plant Indicator derived from (1) the biannual SFWMD Systematic Reconnaissance Flight (SRF) surveys of CERP lands, (2) the RECOVER vegetation and mapping program, (3) the EPA’s REMAP project, and (4) the SFWMD Tree Island Exotic Plant surveys.</p>
<p>Is this PM consistent with RECOVER PMs:</p> <p>RECOVER has a draft biological control performance measure (PM) under review and awaiting acceptance called “BC-1. Reduce acreage of invasive exotic plant species”. Although it is based on an earlier version of this PM (February 2006), the two are more or less consistent. The difference can be seen in the names: the RECOVER PM focuses on the ecological outcome rather than the means used to achieve that goal. Achieving the target of 90% colonization with the biological control is the means to the end, not the end itself. The end is reduced acreages of exotic plants. We suggest this PM focus on the final outcome. We do understand the difficulties of predicting change in acreages and that the changes may occur at too slow a pace than is practical, but the ultimate goals deserve mention and consideration, even though a surrogate of % colonization is used. The system-wide view is to always remember why we are doing things. Dispersal of biocontrol agents are viewed as a method for eradication and not a performance measure. Even though the dissemination rate is measurable, the ultimate goal is eradication and preventing re-invasion.</p> <p>We also comment that dispersal of biocontrol agents may or may not have proportional recession of invasive plants (i.e. more coverage by a biocontrol agent may not equal more reduction of invasive plants). The current evaluation</p>

methodology described does not take into account the effects of other approaches to reducing invasive/exotics, such as active invasive control efforts (mechanical and herbicide treatment). These different control approaches interact by affecting the host plant populations and potentially the biocontrol agent populations. In addition, the evaluation methodology does not identify a means to determine effectiveness of saturation or of different agents being used for eradication.

<p>BC-2 - Reduce Densities Of Invasive Exotic Plant Species</p>
<p><i>CERP Goal:</i> Increase the total spatial extent of natural areas; improve habitat and functional quality; improve native plant and animal species abundance and diversity.</p>
<p><i>CERP Hypotheses:</i> (1) Accelerating the introduction and dispersal of biological control agents will reduce the vigor of invasive plant species. (2) Reductions in invasive plant vigor will lead to reduced population densities, and thereby promote re-invasion by desirable native plant species.</p>
<p><i>Project Objective/Constraints:</i> Restore natural areas that have been invaded through the reduction or elimination of invasive plant species.</p>
<p>Target: The assessment parameters for this Performance Measure are (1) increase invasive-free acreage as measured by the numbers of un-infested grid cells, and (2) reduce density designations of 30% of cells designated as moderate or dense for each targeted invasive plant species.</p>
<p>Evaluation Method: Model outputs will incorporate an Exotic Plant Indicator derived from (1) the biannual SFWMD Systematic Reconnaissance Flight (SRF) surveys of CERP lands, (2) the RECOVER vegetation and mapping program, (3) the EPA's REMAP project, and (4) the SFWMD Tree Island Exotic Plant surveys. These numeric targets have been generated from SFWMD SRF data. GIS maps will be created with layers for (1) boundaries of CERP study regions, (2) relative invasive plant densities, and (3) 10 minute grid coordinates. Plant densities will be categorized based on the proportion of SRF observations in a grid cell that were characterized as sparse (no infestation, a few outliers, or a few small clusters of invasive plants), moderate (modest amounts of invasive plants intermixed with an abundance of native species), or dense (invasive plants in monoculture or very dominant with only modest presence of native species). Grid cells are assigned to the CERP study region which contains greater than 50% of the cell. Where >50% of a cell lies outside CERP entirely, but the remainder was inside, the cell was assigned to the study region in which the included portion fell. Stresses imposed on the invasive plants by biological control agents will lead to reduced invasive plant population densities.</p>
<p>Is this PM consistent with RECOVER PMs:</p> <p>The PM is consistent. It would benefit from more specific targets. Understanding the interplay between changes in hydrology and the fitness of host plants and the survival and dispersal of biocontrol agents will make it possible to better predict effects in the future. RECOVER recommends the targets listed in section 4.2 have numbers associated with these goals. For example, increase the amount of invasive-free acreage as measured by the number of un-infested cells from 100 to 150 and include what overall percentage of the cells the target included. In addition, we recommend that the PDT put a time frame on the target, indicating an</p>

appropriate timeframe for anticipated success. The PM should acknowledge that numbers and densities of invasive plants may actually increase in areas where the biocontrol agent has not yet arrived or has arrived but has not been successful. In addition, host-parasite dynamics (models) often predict cyclic trends for both host and parasites. The PM may indicate in the future that parasite populations decline and exotics again increase. These dynamics should be addressed.

In section 5.4. RECOVER recommends adding a comment on how the uncertainty will be decreased through the monitoring program discussed in section 6.0.

RECOVER recommends providing an explanation in the performance measure documentation sheet for how reductions in invasive plant vigor will lead to reduced population densities.

In section 7.1 RECOVER recommends adding "(3) Plans are lacking for marine exotics that affect oysters (*Perna viridis*) and seagrass (*Caulerpa brachypoda*). This would be especially important in the improvement of the Northern and Southern Estuaries.

<p>BC-3 Prevent Re-Invasion Of Restored Areas</p>
<p><i>CERP Goal:</i> Increase the total spatial extent of natural areas; improve habitat and functional quality; improve native plant and animal species abundance and diversity.</p>
<p><i>CERP Hypotheses:</i> (1) Accelerating the introduction and dispersal of biological control agents will reduce the vigor of invasive plant species by reducing reproductive capacities. (2) Reductions in invasive plant vigor will promote re-invasion by desirable native plant species.</p>
<p><i>Project Objective/Constraints:</i> Restore natural areas that have been invaded through the reduction or elimination of invasive plant species.</p>
<p>Target: The assessment parameters for this Performance Measure are seedling mortality and reproductive capacity of each targeted invasive plant species. The targets are (1) to reduce reproductive capacity by 70% in at least 60% of infested cells, and (2) to double seedling mortality in at least 50% of infested cells.</p> <p>Evaluation Method: Model outputs will describe the sizes, frequencies, and geospatial distribution of releases needed to achieve saturation of the targeted invasive plant’s range by each biological control agent within several different temporal scales. They will also incorporate an Exotic Plant Indicator derived from (1) the biannual SFWMD SRF surveys of CERP lands, (2) the RECOVER vegetation and mapping program, (3) the EPA’s REMAP project, and (4) the SFWMD Tree Island Exotic Plant surveys. GIS maps will be created with layers for (1) boundaries of CERP study regions, (2) relative invasive plant densities, and (3) 10 minute grid coordinates. Plant densities will be categorized based on the proportion of SRF observations in a grid cell that were characterized as sparse (no infestation, a few outliers, or a few small clusters of invasive plants), moderate (modest amounts of invasive plants intermixed with an abundance of native species), or dense (invasive plants in monoculture or very dominant with only modest presence of native species) (see Figures 1 - 5). Grid cells are assigned to the CERP study region which contains greater than 50% of the cell. Where >50% of a cell lies outside CERP entirely, but the remainder was inside, the cell was assigned to the study region in which the included portion fell. Stresses imposed on the invasive plants by biological control agents will lead to reduced plant population densities.</p>
<p>Is this PM consistent with RECOVER PMs:</p> <p>The PM is consistent with RECOVER PMs. We believe the numerical targets listed in section 4.2 are good. RECOVER recommends adding a discussion and reference that the targets listed will prevent re-invasion. In section 5.4, consider adding a comment on how the uncertainty will be decreased through the monitoring program discussed in section 6.0. Same as with BC-2, host-parasite dynamics often predict cyclic trends for both host and parasites. The PM may indicate in the future that</p>

parasite populations decline and exotics again increase. These dynamics should be addressed.